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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample and a personnel evaluation form are also included. (AG)

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B-640
S-360

United States Employment Service Technical Report

January 1966

ED 072060

Development of USES Aptitude Test Battery for Yarn Winder

(any ind.) 6-19.117
681.885

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Washington, D.C. 20210

ED 072060

Technical Report on Development of USES Aptitude Test Battery

For .....

Yarn Winder (any ind.) 6-19.117

681.885

B-640 or S-360

U. S. Employment Service
in Cooperation with
North Carolina State Employment Service

January 1966

GATB Study #2557

DEVELOPMENT OF USES APTITUDE TEST BATTERY

For

Yarn Winder (any ind.) 6-19.117

681.885

B-640 or S-360

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Yarn Winder (any ind.) 6-19.117 (3rd Edition DOT code 681.885). The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB, B-1002 Scores
K - Motor Coordination	80
F - Finger Dexterity	70
M - Manual Dexterity	95

RESEARCH SUMMARY

Sample:
Sixty four (64) females employed as Yarn Winders by the Central Yarn and Dyeing Company and Rocky Mount Mills, Gastonia and Rocky Mount, North Carolina, respectively.

Criterion:
Supervisory ratings

Design:
Concurrent (test and criterion data were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity:
Phi Coefficient = .31 ($P/2 < .01$)

Effectiveness of Norms: Only 66% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 78% would have been good workers. 34% of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 22% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	66%	78%
Poor Workers	34%	22%

SAMPLE DESCRIPTION

Size: N = 64

Occupational Status: Employed workers.

Work Setting: Thirty-six (36) employees worked at the plant at Central Yarn and Dyeing Company in Gastonia, North Carolina and 28 employees worked at the Rocky Mount Mills plant in Rocky Mount, North Carolina.

Employer Selection Requirements:

Education: No requirement

Previous Experience: No requirement

Tests: None used

Other: Personal interview and reference checks.

Principal Activities: The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience: All workers had completed an on-the-job training period of four months. Normal on the job training required for an average worker is less than 4 months.

TABLE 2

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

	Mean	SD	Range	r
Age (years)	38.3	8.7	20-57	.165
Education (years)	8.7	1.7	3-12	.222
Experience (months)	92.2	94.0	4-518	.348**

**Significant at the .01 level

All 12 tests of the GATB, B-1002B were administered during the priod January 1965 through March 1965.

CRITERION

The criterion data consisted of supervisory ratings of job proficiency. Ratings and reratings for each worker were made at approximately the same time as the tests were administered with a time interval of from six to eight weeks between the two ratings.

Rating Scale: Form SP-21, "Descriptive Rating Scale", was used. The scale (See Appendix) used at Central Yarn and Dyeing consists of seven items; the scale used at Rocky Mount Mills consists of nine items. There are five alternatives for each item on the scale. The alternatives indicate the different degrees of job proficiency.

Reliability: The coefficient of reliability between the two ratings is .924 indicating a highly significant relationship. The final criterion score consists of the combined scores of the two sets of ratings, adjusted for variations in number of items.

Criterion Score Distribution:

Possible Range:	18-90
Actual Range:	32-86
Mean:	66.4
Standard Deviation:	11.8

Criterion Dichotomy: The criterion distribution was dichotomized into high and low groups by placing 34% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers."

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitudes F and M which do not have a significant correlation with the criterion were considered for inclusion in the norms because the qualitative analysis indicated that Aptitudes F and M were important for the job duties and the sample had a relatively high mean score for Aptitude M. Tables 3, 4, and 5 show the results of the qualitative and statistical analysis.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performed)

Aptitude	Rationale
P - Form Perception	Necessary to determine when packages are full.
K - Motor Coordination	Necessary in picking up broken yarn and tying yarn rapidly.
F - Finger Dexterity	Essential in tying yarn.
M - Manual Dexterity	Necessary in placing empty packages on machine and doffing full packages.

TABLE 4

Means, Standard Deviations (SD), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Aptitudes	Mean	SD	r
G - General Learning Ability	79.6	14.1	.176
V - Verbal Aptitude	84.7	11.1	-.047
N - Numerical Aptitude	77.1	18.1	.273*
S - Spatial Aptitude	84.8	13.7	.133
P - Form Perception	86.3	16.8	.062
Q - Clerical Perception	95.1	14.5	.212
K - Motor Coordination	96.7	17.1	.301*
F - Finger Dexterity	91.3	19.3	.189
M - Manual Dexterity	106.7	22.7	.245

*Significant at the .05 level

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data: Important					X		X	X	X
Irrelevant									
Relatively High Mean						X	X		X
Relatively Low Standard Dev.	X	X		X		X			
Significant Correlation with Criterion			X				X		
Aptitudes to be Considered for Trial Norms			N			Q	K	F*	M

* Considered essential

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of Aptitudes N, K, F, and M, at trial cutting scores were able to differentiate between the 66% of the sample considered good workers and 34% of the sample considered poor workers. Trial cutting scores at five point intervals approximately one standard deviation below the mean are tried because this will eliminate about one third of the sample with three-aptitude norms. For two-aptitude trial norms, minimum cutting scores of slightly more than one standard deviation below the mean will eliminate about 1/3 of the sample; for four-aptitude trial norms, cutting scores of slightly less than one standard deviation below the mean will eliminate about 1/3 of the sample. The Phi Coefficient was used as a basis for comparing trial norms. Norms of K-80, F-70, and M-95 provided the highest degree of differentiation. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .31 (statistically significant at the .01 level).

TABLE 6

Concurrent Validity of Test Norms K-80, F-70, and M-95

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	13	29	42
Poor Workers	14	8	22
Total	27	37	64

Phi Coefficient (ϕ) = .31 Chi Square (X^2) = 6.31
Significance Level = $P/2 < .01$

DETERMINATION OF OCCUPATIONAL APTITUDE NORMS

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 OAP's included in Section II of the Guide to the Use of the General Aptitude Test Battery. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.

SP-21
Rev. 1/66

A-P-P-E-N-D-I-X

(Rating scale used at Central Yarn and Dyeing Company)

UNITED STATES EMPLOYMENT SERVICE

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

Score____

RATING SCALE FOR _____

D. O. T. Title and Code

Directions: Please read the suggestions to raters on the back of this form and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

Name of Worker (print) _____
(Last) (First)

Sex: Male____ Female____

Company Job Title: _____

How often do you see this worker in a work situation?

- ☐ See him at work all the time.
- ☐ See him at work several times a day.
- ☐ See him at work several times a week.
- ☐ Seldom see him in work situation.

How long have you worked with him?

- ☐ Under one month.
- ☐ One to two months.
- ☐ Three to five months
- ☐ Six months or more

A. How much work can he get done? (Worker's <u>ability</u> to make efficient use of his time and to work at high speed.)

- ☐ **1. Capable of very low work output. Can perform only at an unsatisfactory pace.**
- ☐ **2. Capable of low work output. Can perform at a slow pace.**
- ☐ **3. Capable of fair work output. Can perform at an acceptable but not a fast pace.**
- ☐ **4. Capable of high work output. Can perform at a fast pace.**
- ☐ **5. Capable of very high work output. Can perform at an unusually fast pace.**

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

☐ 1. Performance is inferior and almost never meets minimum quality standards.

☐ 2. The grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.

☐ 3. Performance is acceptable but usually not superior in quality.

☐ 4. Performance is usually superior in quality.

☐ 5. Performance is almost always of the highest quality.

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

☐ 1. Makes very many mistakes. Work needs constant checking.

☐ 2. Makes frequent mistakes. Work needs more checking than is desirable.

☐ 3. Makes mistakes occasionally. Work needs only normal checking.

☐ 4. Makes few mistakes. Work seldom needs checking.

☐ 5. Rarely makes a mistake. Work almost never needs checking.

D. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

☐ 1. Has very limited knowledge. Does not know enough to do his job adequately.

☐ 2. Has little knowledge. Knows enough to "get by."

☐ 3. Has moderate amount of knowledge. Knows enough to do fair work.

☐ 4. Has broad knowledge. Knows enough to do good work.

☐ 5. Has complete knowledge. Knows his job thoroughly.

E. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)

☐ 1. Has great difficulty doing his job. Not at all suited to this kind of work.

☐ 2. Usually has some difficulty doing his job. Not too well suited to this kind of work.

☐ 3. Does his job without too much difficulty. Fairly well suited to this kind of work.

☐ 4. Usually does his job without difficulty. Well suited to this kind of work.

☐ 5. Does his job with great ease. Exceptionally well suited for this kind of work.

F. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)

☐ 1. Cannot perform different operations adequately.

☐ 2. Can perform a limited number of different operations efficiently.

☐ 3. Can perform several different operations with reasonable efficiency.

☐ 4. Can perform many different operations efficiently.

☐ 5. Can perform an unusually large variety of different operations efficiently.

G. Considering all the factors already rated, and only these factors, how acceptable is his work? (Worker's "all-around" ability to do his job.)

☐ 1. Would be better off without him. Performance usually not acceptable.

☐ 2. Of limited value to the organization. Performance somewhat inferior.

☐ 3. A fairly proficient worker. Performance generally acceptable.

☐ 4. A valuable worker. Performance usually superior.

☐ 5. An unusually competent worker. Performance almost always top notch.

SP-21
Rev. 2/61

(Rating scale used at Rocky Mount Mills)

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

Score____

RATING SCALE FOR _____
D. O. T. Title and Code

Directions: Please read Form SP-20, "Suggestions to Raters", and then fill in the items listed below. In making your ratings, only <u>one</u> box should be checked for each question.

Name of Worker (print) _____
(Last) (First)

Sex: Male_____ Female_____

Company Job Title: _____

How often do you see this worker in a work situation?

☐ See him at work all the time.

☐ See him at work several times a day.

☐ See him at work several times a week.

☐ Seldom see him in work situation.

How long have you worked with him?

☐ Under one month.

☐ One to two months.

☐ Three to five months.

☐ Six months or more.

A. How much work can he get done? (Worker's ability to make efficient use of his time and to work at high speed.)

☐ 1. Capable of very low work output. Can perform only at an unsatisfactory pace.

☐ 2. Capable of low work output. Can perform at a slow pace.

☐ 3. Capable of fair work output. Can perform at an acceptable but not a fast pace.

☐ 4. Capable of high work output. Can perform at a fast pace.

☐ 5. Capable of very high work output. Can perform at an unusually fast pace.

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

☐ 1. Performance is inferior and almost never meets minimum quality standards.

☐ 2. The grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.

☐ 3. Performance is acceptable but usually not superior in quality.

☐ 4. Performance is usually superior in quality.

☐ 5. Performance is almost always of the highest quality.

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

☐ 1. Makes very many mistakes. Work needs constant checking.

☐ 2. Makes frequent mistakes. Work needs more checking than is desirable.

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☐ 4. Makes few mistakes. Work seldom needs checking.

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D. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

☐ 1. Has very limited knowledge. Does not know enough to do his job adequately.

☐ 2. Has little knowledge. Knows enough to "get by."

☐ 3. Has moderate amount of knowledge. Knows enough to do fair work.

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E. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)

☐ 1. Has great difficulty doing his job. Not at all suited to this kind of work.

☐ 2. Usually has some difficulty doing his job. Not too well suited to this kind of work.

☐ 3. Does his job without too much difficulty. Fairly well suited to this kind of work.

☐ 4. Usually does his job without difficulty. Well suited to this kind of work.

☐ 5. Does his job with great ease. Exceptionally well suited for this kind of work.

F. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)

☐ 1. Cannot perform different operations adequately.

☐ 2. Can perform a limited number of different operations efficiently.

☐ 3. Can perform several different operations with reasonable efficiency.

☐ 4. Can perform many different operations efficiently.

☐ 5. Can perform an unusually large variety of different operations efficiently.

G. How resourceful is he when something different comes up or something out of the ordinary occurs? (Worker's ability to apply what he already knows to a new situation.)

☐ 1. Almost never is able to figure out what to do. Needs help on even minor problems.

☐ 2. Often has difficulty handling new situations. Needs help on all but simple problems.

☐ 3. Sometimes knows what to do, sometimes doesn't. Can deal with problems that are not too complex.

☐ 4. Usually able to handle new situations. Needs help on only complex problems.

☐ 5. Practically always figures out what to do himself. Rarely needs help, even on complex problems.

H. How many practical suggestions does he make for doing things in better ways? (Worker's ability to improve work methods.)

☐ 1. Sticks strictly with the routine. Contributes nothing in the way of practical suggestions.

☐ 2. Slow to see new ways to improve methods. Contributes few practical suggestions.

☐ 3. Neither quick nor slow to see new ways to improve methods. Contributes some practical suggestions.

☐ 4. Quick to see new ways to improve methods. Contributes more than his share of practical suggestions.

☐ 5. Extremely alert to see new ways to improve methods. Contributes an unusually large number of practical suggestions.

I. Considering all the factors already rated, and <u>only</u> these factors, how acceptable is his work? (Worker's "all-around" ability to do his job.)

☐ 1. Would be better off without him. Performance usually not acceptable.

☐ 2. Of limited value to the organization. Performance somewhat inferior.

☐ 3. A fairly proficient worker. Performance generally acceptable.

☐ 4. A valuable worker. Performance usually superior.

☐ 5. An unusually competent worker. Performance almost always top notch.

S-360 January 1966

FACT SHEET

Job Title: Yarn Winder (any ind.) 6-19.117 (681.885)

Job Summary: Tends yarn winding machine to wind yarn from one type package to another for further processing or shipment.

Work Performed: Removes full package from trough and places on spindle. Locates yarn end on package and threads yarn through tension and other devices and guides, over traverse drum, and around cone, tube, or other holder. Places holder on spindle and against traverse drum. Patrols and observes yarn winding machine to detect broken yarn or exhausted supply and locates yarn end or replenishes supply and ties ends by hand or by hand knotter device. Doffs filled packages and/or empty holders.

(This sheet is printed in duplicate. One copy should remain as part of the Appendix in order to complete the technical report. The other copy can be removed by employment service personnel who wish to set up separate fact sheet files.)

S-360 January 1966

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